Honeywell Docket No. 30-4874 (4960)
Bingham Docket No.: 7037172001-3225000

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor:	**Kweeder et al.**	Examiner:	**Robert A. Madsen**
Serial No:	**09/468,668**	Art Unit:	**1761**
Filed:	**December 21, 1999**		
For:	**PRILLING METHOD**		

DECLARATION OF JAMES KWEEDER
UNDER 35 USC §1.132

I, the undersigned, James Kweeder, hereby declare as follows:

1. My educational and professional qualifications are shown in the attached resume (see Exhibit A).

2. Further to my work in connection with the prosecution of the above-referenced patent application, I have read and I understand the text of the following documents and issued patents (hereafter referred to as "cited art"):

   a. Hoogendonk (US 3083406)
   b. Frenken et al (US 3988398)
   c. Otsuka et al (US 3529326)
   d. Holland et al., Fluid Flow for Chemical Engineers, pp. 52, 53 and 55, (1995)
   e. Hanke et al (US 5466281)
   f. Bassetti et al (US 5378259)
   g. Stengel (US 3021207)

3. It is my understanding from reading and reviewing the cited art that none of these references separately teach:

> A method to prill a shear-thinnable mixture comprising the steps of:
>
> providing a molten first component;
>
> mixing at least a second component with said molten first component;
>
> reacting said components at a temperature and for a time sufficient to form a shear-thinnable mixture having a viscosity, whereby the viscosity decreases with increased shear rate;
>
> mechanically agitating said shear-thinnable mixture by an agitator in a prill head, wherein essentially the entire liquid volume in said prill head is swept by said agitator to shear thin said shear-thinnable mixture; and permitting said shear-thinned mixture to flow through holes in said prill head under the influence of a force selected from the group consisting of static pressure and centrifugal force.

4. Respectfully submits that the terms *thixotropic* and *shear-thinnable*, while related, are not interchangeable and not understood in the field to mean the same thing. Examination of the Holland reference, particularly figures 1.20 and 1.21 (and the referencing text) illustrate the difference. *Shear-thinnable* refers to those liquids in which the viscosity decreases with increasing shear rate independent of time. *Thixotropic*, alternatively, describes a fluid in which the viscosity decreases with time while at constant shear-rate. While it is possible that a particular fluid be both thixotropic and shear-thinning (as illustrated in figure 1.21 of Holland), it is not required. A thixotropic viscosity can be independent of shear-rate (that is, Newtonian with respect to shear-rate but non-Newtonian with respect to time).

5. The difference between *shear-thinning* and *thixotropic* necessitates different approaches to device design. While exploiting either behavior requires shearing the material, it does not follow that one device suitable for one behavior will necessarily function as anticipated with the other behavior. In particular, *shear-thinning* usually requires that a particular shear-rate be achieved to accomplish the targeted viscosity. Consequently, it is necessary to specify that adequate shear-rate by the combination of shear device geometry and device velocity. *Thixotropy*, conversely, requires that shear be maintained for a specified time period. A device designed for shear-thinning may not sustain shear sufficiently long to process a thixotropic material and a device designed for thixotropy may not achieve adequate shear to process a shear-thinning material.

6. As one who is skilled in the art of fertilizer chemistry and fertilizer production, it would not be obvious to me, after a fair reading of each member of the cited art and after reviewing the combined cited art, to prill a shear-thinnable mixture, as listed in paragraph 3, because of the following:

Hoogendonk Reference

a. Hoogendonk states in Column 1, lines 54-65 that:

> "In accordance with the present invention it has been found that prills of good quality can be obtained if the melt is sprayed from a reservoir which has a scraper arrangement including a rotary element rolling along the upright wall of the reservoir while the latter rotates. Owing to the rolling movement of the said element the inner wall of the reservoir remains clean and the spray openings do not become clogged. Due to the thixotropic properties of the melts to be sprayed, the shearing stresses produced by the rolling movement of the rotary element causes the melts to remain sufficiently fluid so that no solid material will deposit on the wall or in the spray openings."

b. As I read the above paragraph in the Hoogendonk reference, I first question the assertion that the melts are fluid as based on thixotropic properties. I assert that it may be the pressure created by the rollers, similar to the action of a positive peristaltic pump (see Exhibit B), causing the melts to prill easily over conventional methods used.

c. In addition, as I read the above paragraph, if in fact the melts are fluid based on thixotropic properties, then as I - one of ordinary skill in the art - understand it, the only part of the melt that is thixotropic is that part of the melt that is between the inner wall and the rollers. There is absolutely no teaching or suggestion in Hoogendonk that any portion of the remaining melt, such as that portion of the melt in the middle of the apparatus, is being swept by the rollers or thixotropic.

d. Hoogendonk states in Column 1, lines 35-42 that: "It is therefore an object of the present invention to provide an improved prilling device which prevents clogging of the spray openings and which has a relatively long life. A further object of the present invention is to provide an improved prilling device which utilizes a rolling member for preventing clogging of the spray openings."

e. Hoogendonk mentions thixotropic fluids briefly without any discussion on these types of fluids or the shear-rate and/or time requirements when working with thixotropic fluids.

f. Hoogendonk also does not suggest to one of ordinary skill in the art that there might be some benefit to sweeping and/or agitating the entire liquid volume in the prill head to shear thin a shear-thinnable mixture.

g. If the agitator action of Hoogendonk does in fact work, it would be limited to the shear zone between the roller and the wall. The agitator action would not affect the entire liquid volume in the prill head.

h. Hoogendonk discloses a prilling device with an integral "agitator" that is specifically configured to roll along the inside wall of the prilling device for the specific purpose of keeping the prilling orifices "clear". One embodiment includes pins on the rolling device to mechanically clear the holes, the other is silent in whether a smooth roller or something textured is used to enhance clearing. (see Column 1, lines 59-66) But there is no teaching or suggestion that there is any benefit to using rollers to agitate or sweep the entire liquid volume of the reservoir, as mentioned in claim 1 of the above-referenced patent application.

Frenken Reference

a. The Frenken device includes a pump impeller with the specific purpose of raising the interior fluid pressure and forcing the melt to flow through the holes. The above-referenced patent application very specifically states that we prill through a combination of static and/or centrifugal pressure and not via pressurization.

b. The Frenken reference, like the Hoogendonk reference, is not placing any importance or critical embodiment on sweeping and/or agitating essentially the entire liquid volume in the reservoir to shear-thin a shear-thinnable liquid. In Column 2 of the reference, lines 14-23, it is explicitly stated that the distance from the inner wall of the reservoir to the ends of the blades **is not critical**.

c. As a comparison, DE 2355660 teaches a cylindrical chamber with stirring blades, similar to that described in Frenken. However, the DE 2355660 points out that modifying the configuration of the chamber to be similar to the one described in the above-mentioned patent application would result in thickening, clogging of the prill holes, nonuniform product, large fraction of reject course grains and occasional large agglomerates that did not solidify in the prill tower.

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Otsuka Reference

a. The Otsuka reference is filled with references to how difficult it is to take the molten materials described in Otsuka and process them by conventional prilling methods, including those that utilize agitators. (see Columns 5-6)

b. In order to combat the problems seen when incorporating the molten materials of Otsuka, Otsuka engineers using a series of mesh screens to break up and disperse the molten materials.

c. After a fair reading of Otsuka, I would understand how to produce molten materials containing nitrogen and potassium or phosphorus - but I would not understand how these molten compounds can be utilized by any conventionall or modified prilling methods other than those described in the Otsuka reference, especially after reading Columns 5 and 6 of the reference.

Holland and Hanke References

The Holland and Hanke references merely disclose thixotropic and shear-thinning materials. There doesn't appear to be anything in either the Holland reference or the Hanke reference that cures the deficiencies of the Otsaka reference, the Hoogendonk reference or the Frenken reference, in combination with one or all of them, that would lead someone in the field of fertilizer chemistry and fertilizer production to prill a shear-thinnable mixture.

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Bassetti and Stengel References

The Bassetti and Stengel references disclose ammonium nitrate fertilizers and mixtures. There doesn't appear to be anything in either the Bassetti reference or the Stengel reference that cures the deficiencies of the Otsaka reference, the Hoogendonk reference or the Frenken reference, in combination with one or all of them, that would lead someone in the field of fertilizer chemistry and fertilizer production to prill a sheer-thinnable mixture.

I hereby declare that all statements made herein of my own knowledge are true and that statements made on information or belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Title 18, United States Code, Section 1001, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Executed at Chester, Virginia, this 28 day of July, 2005.

By: James Kweeder

James Kweeder, Ph.D.